

The contemporary appearance of the large amount of magnesia and that of alkalies in D agrees neither with the relative proportion of the substances in A nor with that in B. It seems, however, proper to say that the substances in D were washed out within both periods of degradation, as represented by A and B. According to this acceptance, the silicate D had to show an analogous character with the silicate C, which finds indeed its confirmation by the proportion of the oxygen of the bases to that of silicic acid, which is in both an equal one, namely, 1.2; a proportion which is in the middle of both above mentioned, viz : 1.1.7 and 1.2.8.

We see by the above mentioned facts that the volcanic rocks, especially those which are rich in alkalies and clay, give away by the process of degradation a large quantity of potash and soda, combined with silicic acid, salts, which, by their solubility, are easily washed out by rain water, and then capable of penetrating the soils: whilst the remaining products of degradation become more and more of a clayey character, (the origin of all clayey compounds,) and poorer in alkaline substances and soluble silicic acid; that, however, the degradation never can advance to such a degree that the latter substances will be entirely washed out and consequently absent. All soils contain therefore soluble silicic acid and alkalies, on account of the clay present in them, which is one of their fundamental ingredients. Humus, as we have previously stated, possesses the property to retain alkaline substances and soluble silicic acid in a manner similar to clay. This may, to a certain extent, explain the reason of the fact, that the produce of the soil, other things being equal, is in direct ratio to its humus and clay.

From all, then, that has been said, from the known and ascertained condition of soils of known fertility; from the composition of crops that are grown for food; from the effects of the application of manures, it is to be concluded that the productiveness of a soil *to the extent of the production of the plant is due:*

1st. To the presence, in exact ratio, of the mineral constituents named above.

2d. The condition in which these substances are found as to their solubility.

3d. The capacity of the soil, as to its physical texture, to supply the growing plant with organic food from the atmosphere.

The proportion of the several mineral constituents best adapted to produce fertility and the requisite physical structure can be found, or at least approximated to, by a large